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Mounting arrangement [redacted] automotive engine with longitu[redacted]lly arranged cylinders.

Veröffentlichungsnr. (Sek.)	EP0514943
Veröffentlichungsdatum :	1992-11-25
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Anmelder ::	NISSAN MOTOR (JP)
Veröffentlichungsnummer :	☐ EP0514943, A3, B1
Aktenzeichen: (EPIDOS-INPADOC-normiert)	EP19920108712 19920522
Prioritätsaktenzeichen: (EPIDOS-INPADOC-normiert)	JP19910148095 19910524
Klassifikationssymbol (IPC) :	B60K5/02
Klassifikationssymbol (EC) :	B60K5/02, B60K17/34
Korrespondierende Patentschriften	DE69213818D, DE69213818T, JP2679451B2, ☐ JP4345528, ☐ US5303798

Bibliographische Daten

In a mounting arrangement for an internal combustion engine with at least one row of cylinders arranged in a longitudinal direction of a four-wheel drive or a front-wheel drive automotive vehicle, which employs a front-wheel drive shaft and a front differential connected to said front-wheel drive shaft, the front-wheel drive shaft and the front differential are both arranged at the side of the engine in the vicinity of the front end of the engine block, and engine mounts mounting the engine, are arranged backwardly of said front-wheel drive shaft, so as to assure a shorter entire length and a shorter entire width of the power plant and to provide an optimal car weight balance between front and rear wheels.

By Express Mail
No. EL 793472185 US

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 514 943 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
18.09.1996 Bulletin 1996/38

(51) Int. Cl.[6]: **B60K 5/02**

(21) Application number: **92108712.8**

(22) Date of filing: **22.05.1992**

Kein Einspruch

(54) Mounting arrangement for automotive engine with longitudinally arranged cylinders

Einbauanordnung eines Fahrzeugmotors mit in Reihe angeordneten Zylindern

Dispositif de fixation pour un moteur de véhicule avec cylindres disposés longitudinalement

(84) Designated Contracting States:
DE GB

(30) Priority: **24.05.1991 JP 148095/91**

(43) Date of publication of application:
25.11.1992 Bulletin 1992/48

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(56) References cited:
EP-A- 0 347 260
AT-B- 383 998
DE-A- 3 604 144
DE-A- 3 920 638

Remarks:
The file contains technical information submitted after the application was filed and not included in this specification

Claim 1 : Sp. 6 :
Lotus : with vom Motor ?
→ Lotus ?

EP 0 514 943 B1

Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a mounting arrangement for an automotive engine with at least one row of cylinders arranged in a longitudinal direction of the vehicular body, and specifically to a mounting arrangement for an automotive engine with a longitudinal arrangement of cylinders, which is suitable for a front-wheel drive vehicle or a four-wheel drive vehicle.

Description of the Prior Art

As is generally known, there are two engine arrangements, one being an arrangement for an engine with cylinders arranged in a longitudinal direction of the vehicle, and the other being an arrangement for an engine with cylinders arranged in a lateral direction of the vehicle. The longitudinal arrangement for the engine is advantageous due to more maintenance space defined at both sides of the longitudinally arranged engine. However, this longitudinal arrangement results in a relatively long over-all length of the engine in the longitudinal direction of the vehicle and consequently a relatively large front overhang. For this reason, such a longitudinal arrangement would be unsuitable for a front-wheel drive vehicle or a four-wheel drive vehicle, wherein a front-wheel drive unit as well as the engine are provided in the engine room.

Recently, there have been proposed and developed various four-wheel drive vehicles employing a V-type engine, such as a V-6 engine or a V-8 engine. The V-type engine is advantageous to provide a shorter entire length of the power plant or engine, when compared with an in-line engine. In general, the V-type engine permits a relatively short front overhang. Therefore, such a V-type engine would be widely applied for four-wheel drive vehicles. Assuming that the V-type engine is applied for a four-wheel drive vehicle or a front-wheel drive vehicle, there are three traditional engine mounting arrangements respectively shown in Figs. 1, 2 and 3. For instance, Japanese Patent First Publication Tokkai (Heisei) 4-108037 (corresponding to Japanese Patent Application No. 2-224581) discloses an engine mounting arrangement similar to that of Figs. 1, 2 or 3.

From DE-A-3 604 144 there is known a four-wheel drive vehicle having a longitudinally mounted engine. A front-wheel differential gearing is located laterally offset and below a front section of an oil pan of said engine.

The FR-A-1 144 772 discloses a front-wheel driven motor vehicle having a shift gearing arranged in front of a longitudinally mounted engine. Said shift gearing and said engine are flanged together such that said engine is disposed behind the front wheel axis.

From the prior art document EP-A-0 347 260 there is known a drive system for vehicles having an engine arranged in such a manner the engine protrudes more than 50% of its entire length over the vehicle's front axis in the vehicle's forward direction.

For the purpose of simplification of description, the same reference numerals used in the conventional engine mounting arrangement shown in Fig. 1 will be applied to the corresponding elements used in the other conventional engine mounting arrangements shown in Figs. 2 and 3 and also applied to the corresponding elements used in a preferred embodiment of an improved engine mounting arrangement shown in Figs. 4, 5 and 6, hereinbelow described in detail.

Referring now to Fig. 1, there is shown a first exemplified prior art mounting arrangement for a V-type engine. The engine mounting arrangement is determined depending on a relative position relationship among a power plant or an engine body 1 of an automotive internal combustion engine, a power train, which includes a transmission 2 (or a torque converter housing), a front differential 3, a companion flange 4, a front-wheel drive shaft 5, a propeller shaft 6, and so on, and engine-body accessories, which include a power-steering pump 7, a compressor 8 for an air conditioner, a starter motor 9, and so forth, and other parts, for example engine mounts 10, a steering rack unit 11, a steering gear 12, and so on. The first exemplified engine mounting arrangement shown in Fig. 1 is characterized in that the front differential 3 is considerably offset from the side wall of the engine 1, so as to prevent a front flange 2a of the transmission 2, which is mounted on the rear end of the engine block, from interfering with the rear end 3a of the front differential 3 and with a connecting portion 6a between the front differential 3 and the propeller shaft 6. As appreciated from the offsetting front differential 3 shown in Fig. 1, the entire width W of the engine room is increased, thereby reducing the advantage of the previously noted longitudinal arrangement for the engine. According to the first engine arrangement of Fig. 1, since the engine mounts 10 are arranged in front of the front differential 3 and in addition the engine-body accessories, such as the power-steering pump 7 and the compressor 8, are further arranged in front of the engine mounts 10, the first engine arrangement is disadvantageous to provide a shorter entire length L of the power plant.

Referring now to Fig. 2, there is shown a second exemplified prior art mounting arrangement for a V-type engine. The second exemplified engine mounting arrangement shown in Fig. 2 is characterized in that the rear end of the engine crankshaft is longitudinally extended by a designated length of extension 1a, so as to avoid the previously noted interference between the front flange 2a and the rear end 3a of the front differential 3 or the connecting portion 6a. The second engine arrangement is also disadvantageous to provide a shorter entire length L of the power plant.

Referring now to Fig. 3, there is shown a third exemplified prior art mounting arrangement for a V-type engine. The third exemplified engine mounting arrange-

ment shown in Fig. 3 is characterized that the front differential 3 is arranged in a more forward position than the mounting position of the differential 3 shown in Fig. 1 or Fig. 2 and as a result the engine-body accessories, such as the power-steering pump 7 and the compressor 8 are relocated from the engine body 1 to the other auxiliary driving unit (not shown). The third engine arrangement permits both a shorter entire length L and a shorter entire width W. However, the third engine arrangement requires an auxiliary drive unit for driving the above-mentioned engine-body accessories. This results in an increase in total cost of the vehicle.

SUMMARY OF THE INVENTION

It is therefore, in view of the above disadvantages, an object of the present invention to provide a mounting arrangement for an automotive engine with at least one row of cylinders arranged in a longitudinal direction of the vehicle body, which can be optimally applied for a four-wheel drive vehicle or a front-wheel drive vehicle without increasing total manufacturing cost, while keeping both a shorter entire length and a shorter entire width of the power plant.

It is another object of the invention to provide a mounting arrangement for an automotive engine with at least one row of cylinders arranged in a longitudinal direction of the vehicle body, which can prevent a front heavy tendency and provide an optimal car weight balance between front and rear wheels.

In order to accomplish the aforementioned and other objects, a mounting arrangement for an internal combustion engine with at least one row of cylinders arranged in a longitudinal direction of a four-wheel drive or a front-wheel drive automotive vehicle, which employs a front-wheel drive shaft and a front differential connected to said front-wheel drive shaft, is characterized in that the front-wheel drive shaft and the front differential are both arranged at the side of the engine in the vicinity of the front end of the engine body, and in addition engine mounts mounting the engine, are arranged rearwardly of the front-wheel drive shaft.

According to another aspect of the invention, a mounting arrangement for an internal combustion engine with at least one row of cylinders arranged in a longitudinal direction of a four-wheel drive or a front-wheel drive automotive vehicle, which employs a front-wheel drive shaft and a front differential connected to the front-wheel drive shaft, is characterized in that the front-wheel drive shaft and the front differential are both arranged at the side of the engine in the vicinity of the front end of the engine body, engine-body accessories, attached to the engine body, are arranged in front of the front-wheel drive shaft, and engine mounts mounting the engine, are arranged rearwardly of the front-wheel drive shaft. It is preferable that one of the engine-body accessories is arranged substantially upwardly of the front differential. The engine-body accessories include a power-steering pump unit, an alternator, and a compressor for an automotive conditioner, each having a driven connection with an engine crankshaft.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1 to 3 are plan views illustrating three conventional mounting arrangements for a V-type engine.

Fig. 4 is a plan view illustrating an engine mounting arrangement of the preferred embodiment according to the invention.

Fig, 5 is a side view illustrating the engine mounting arrangement of the embodiment shown in Fig. 4.

Fig. 6 is a front view illustrating the engine mounting arrangement of the embodiment shown in Figs. 4 and 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Figs. 4, 5 and 6, there is shown an improved engine mounting arrangement of the embodiment according to the invention, which is applied for a four-wheel drive vehicle employing a V-6 engine. As shown in Fig. 5, both the front differential 3 and the front-wheel drive shaft 5 are offset by a distance F_1 in a more forward position than a standard or usual mounting position of the drive shaft 5. Due to offsetting of the differential 3 and the drive shaft 5, the steering rack unit 11 is also offset by the distance F_2 in a more forward position than a usual position thereof. The engine mounts 10 are mounted on a suspension member 13, which is arranged rearwardly of the front-wheel drive shaft 5, based on the above-noted offsetting of the differential 3 and the drive shaft 5. As shown in Fig. 4, the engine-body accessories, such as the compressor 8 for the automotive air conditioner and the alternator 14, are retained in usual positions, in front of the front-wheel drive shaft 5. The above-exemplified accessories have a driven connection with the engine crankshaft. As seen in Fig. 6, the power-steering pump unit 7 is arranged below of the compressor 8. In Fig. 6, reference numerals 15 and 16 respectively denote a mounting member for mounting the suspension member 13 on the vehicle body and a front side member.

As set forth above, since both the front differential 3 and the front-wheel drive shaft 5 are arranged to be offset by the distance F_1 in a more forward position than the usual position, such an arrangement reliably prevents the previously noted interference between the front flange 2a of the transmission 2 and the rear end 3a of the front differential 3 and between the front flange 2a and the connecting portion 6a of the propeller shaft 6. As appreciated from the above, the engine mounting arrangement of the embodiment permits a shorter entire length L and a shorter entire width W of the power plant 1, without offsetting the front differential 3 outside of the side wall of the engine and without longitudinally extending the rear end of the engine crankshaft.

As shown in Figs. 5 and 6, since the front differential 3 is usually disposed below the engine mounts 10,

the alternator 14 can be arranged subs ly above the front differential 3 rather than just in front of the front differential 3. As set forth above, the engine mounting arrangement of the embodiment is considerably advantageous to reduce the entire length L of the power plant. In the conventional engine mounting arrangements shown in Figs. 1 and 2, such an alternator arrangement is difficult, since the engine mounts 10 are arranged in front of the front-wheel drive shaft 5 and the front differential 3.

According to the embodiment, since the power plant 1 is arranged rearwards in relation to the front-wheel drive shaft 5, a longitudinal distance D between the front-wheel drive shaft 5 and a center-of-gravity S of the engine weight can be set to a relatively large value, in comparison with a usual distance obtained in a usual front differential arrangement. This prevents a front heavy tendency. Therefore, the engine mounting arrangement according to the invention may provide an optimal car weight balance between front and rear wheels. Due to the frontward arrangement of the front-wheel drive shaft, the wheelbase is increased and as a result the riding comfort of the vehicle is improved.

Moreover, in the embodiment, since the engine mounts 10 are not arranged in front of the front-wheel drive shaft 5 but rearwardly of the drive shaft 5, and only the engine-body accessories including the alternator 14, the compressor 8 and the power-steering pump unit 7 are arranged in front of the front-wheel drive shaft 5, such an arrangement assures a relatively large space for the engine mounts 10, even in a limited space in the engine room. As appreciated from the above, since the engine mount having a high rigidity can be disposed in such a relatively large engine mount space, without introducing interference between the engine mount 10 and other parts, the mounting rigidity for the engine may be enhanced.

In the preferred embodiment, although the engine mounting arrangement according to the invention is applied to a four-wheel drive vehicle employing a V-6 engine, such an engine mounting arrangement may be applied to a front-wheel drive vehicle employing a front differential and a front-wheel drive shaft, and may be applied to a four-wheel drive or front-wheel drive vehicle employing an automotive engine with at least one row of cylinders arranged in a longitudinal direction of the vehicular body, including V-type engines, in-line engines, or the like.

Claims

1. A mounting arrangement for an internal combustion engine with at least one row of cylinders arranged in longitudinal direction of a four-wheel drive or a front-wheel drive automotive vehicle, which employs a front-wheel drive shaft (5) and a front differential (3) connected to said front-wheel drive shaft (5), **characterized in that** said front differential (3) is arranged at either left or right-hand side of the engine (1) in the vi of the front end of the body of said engine (1) and in that engine mounts (10) for mounting the engine (1) are arranged rearwardly of said front-wheel drive shaft (5).

2. A mounting arrangement as claimed in claim 1, **characterized in that** said engine mounts (10) consists of a pair of transversely opposed mounts which mounts are supported on a high-rigidity suspension member (13) so that said engine mounts (10) are closer to a bottom of the body of the engine (1).

3. A mounting arrangement as claimed in any one of preceding claims, **characterized in that** said front-wheel drive shaft (5) is arranged at both sides of the engine (1) in the vicinity of the front end of the body of the engine (1), and in that engine-body accessories which accessories are attached to the engine (1) and include a power-steering pump unit (7), an alternator (14), and a compressor (8) for an automotive air conditioner, each having a driven connection with an engine crankshaft, are arranged in front of said front-wheel drive shaft.

4. A mounting arrangement as claimed in claim 3, **characterized in that** at least one of said engine-body accessories is arranged above said front differential (3).

Patentansprüche

1. Einbauanordnung für einen Verbrennungsmotor mit wenigstens einer in Längsrichtung eines Fahrzeuges mit Vorderradantrieb oder Vierradantriebe verlaufenden Zylinderreihe, bei welchem eine Vorderradantriebswelle (5) und ein mit dieser Vorderradantriebswelle (5) verbundenes Vorderachsdifferential (3) vorgesehen ist, **dadurch gekennzeichnet,** daß das Vorderachsdifferential (3) entweder auf der linken oder der rechten Seite des Motors (1) in der Nähe des vorderen Endes des Motorkörpers des Motors (1) angeordnet ist, und daß Motorhalterungen (10) zur Halterung des Motors (1) hinter der Vorderradantriebswelle (5) angeordnet ist.

2. Einbauanordnung nach Anspruch 1, **dadurch gekennzeichnet,** daß die Motorhalterungen (10) aus einem Paar von einander quer gegenüberliegenden Halterungen bestehen, welche auf einem hochfesten Aufhängungsteil (13) gehaltert sind, derart, daß die Motoraufhängung (10) dem Boden des Motorkörpers (1) näher ist.

3. Einbauanordnung nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet,** daß die Vorderradantriebswelle (5) zu beiden Seiten des Motors (1) in der Nähe des vorderen Endes des

Motorkörpers (1) angeordnet ist, daß an dem Motorkörper (1) befestigte Motoranbauteile, welche eine Lenkhilfspumpeneinheit (7), eine Lichtmaschine (14) und einen Kompressor für eine Luftklimatisierungseinrichtung umfassen und jeweils mit der Kurbelwelle antriebsverbunden sind, vor der Vorderradantriebswelle angeordnet sind.

4. Einbauanordnung nach Anspruch 3, **dadurch gekennzeichnet,** daß wenigstens eines der Motoranbauteile oberhalb des Vorderachsdifferentiales (3) angeordnet ist.

Revendications

1. Dispositif de fixation pour un moteur à combustion interne avec au moins une rangée de cylindres agencés en direction longitudinale d'un véhicule automobile à quatre roues motrices ou à traction avant, qui emploie un arbre d'entraînement (5) des roues avant et un différentiel avant connecté audit arbre d'entraînement des roues avant (5), caractérisé en ce que ledit différentiel avant (3) est agencé du côté gauche ou droit du moteur (1) à proximité de l'extrémité avant de la carcasse dudit moteur (1) et en ce que les montages (10) du moteur pour fixer le moteur (1) sont agencés vers l'arrière dudit arbre d'entraînement (5) des roues avant.

2. Agencement de montage selon la revendication 1, caractérisé en ce que lesdits montages (10) du moteur se composent d'une paire de montages transversalement opposés, lesquels montages sont supportés sur un organe de suspension (13) de grande rigidité, de manière que les montages (10) du moteur soient plus proches du fond de la carcasse du moteur (1).

3. Dispositif de fixation selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit arbre d'entraînement (5) des roues avant est agencé des deux côtés du moteur (1), à proximité de l'extrémité avant de la carcasse du moteur (1), et en ce que les accessoires de la carcasse du moteur, lesquels accessoires sont attachés au moteur (1) et comprennent l'unité de pompe (7) de direction assistée, un alternateur (14) et un compresseur (8) pour un climatiseur d'automobile, chacun ayant une connexion menée avec un vilebrequin du moteur, sont agencés devant ledit arbre d'entraînement des roues avant.

4. Dispositif de fixation selon la revendication 3, caractérisé en ce qu'au moins l'un des accessoires de la carcasse du moteur est agencé au-dessus dudit différentiel avant (3).

FIG.1

(PRIOR ART)

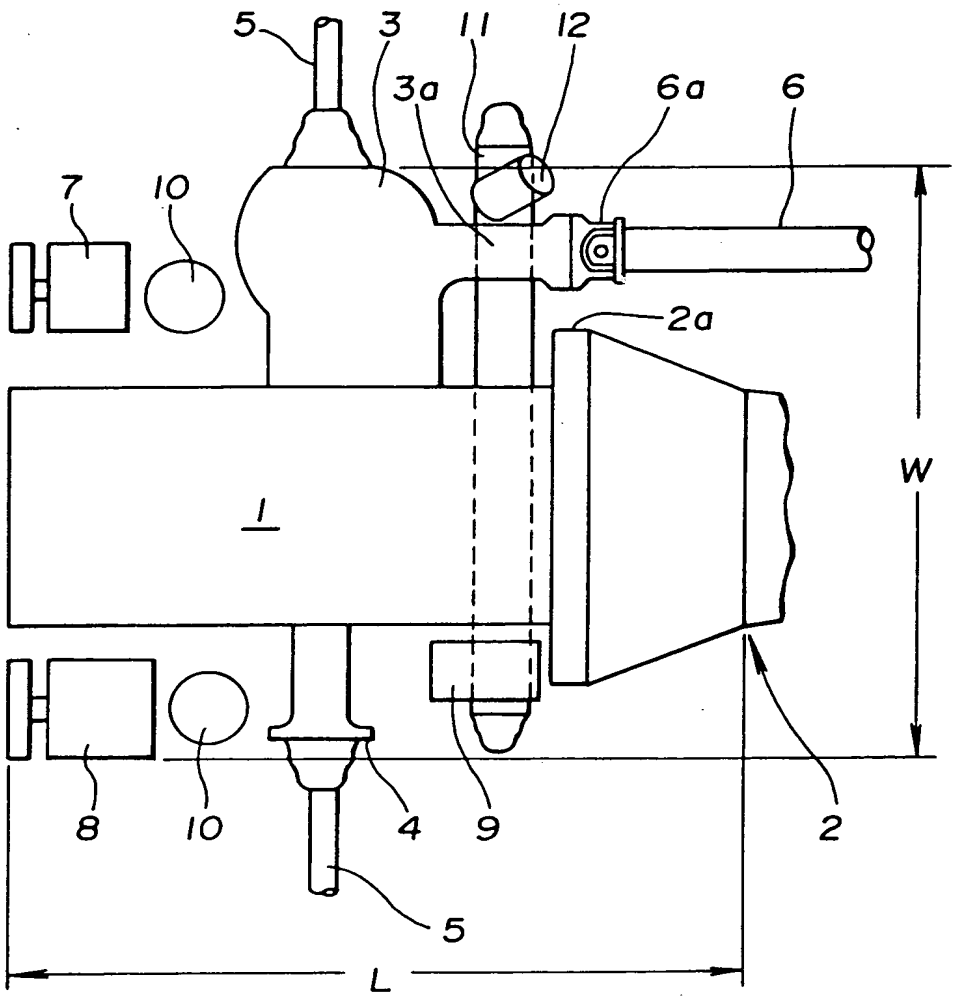

FIG. 2

(PRIOR ART)

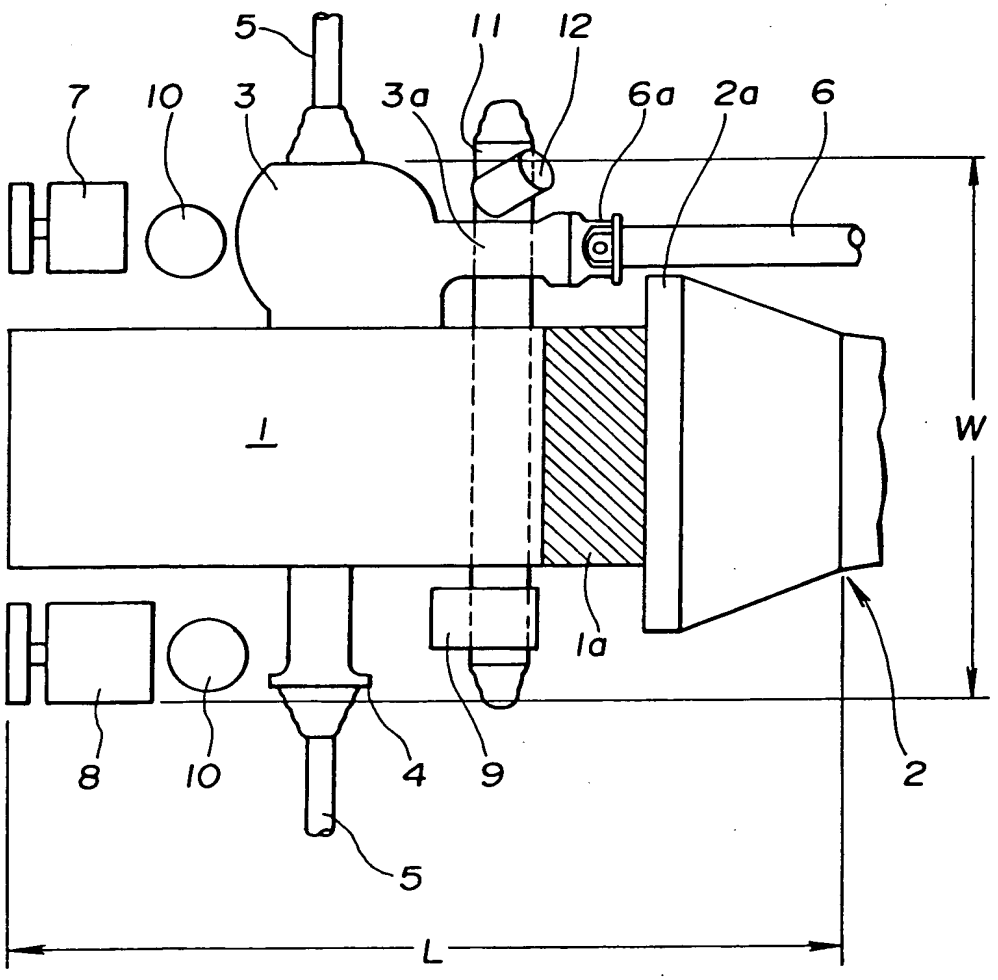

FIG. 3
(PRIOR ART)

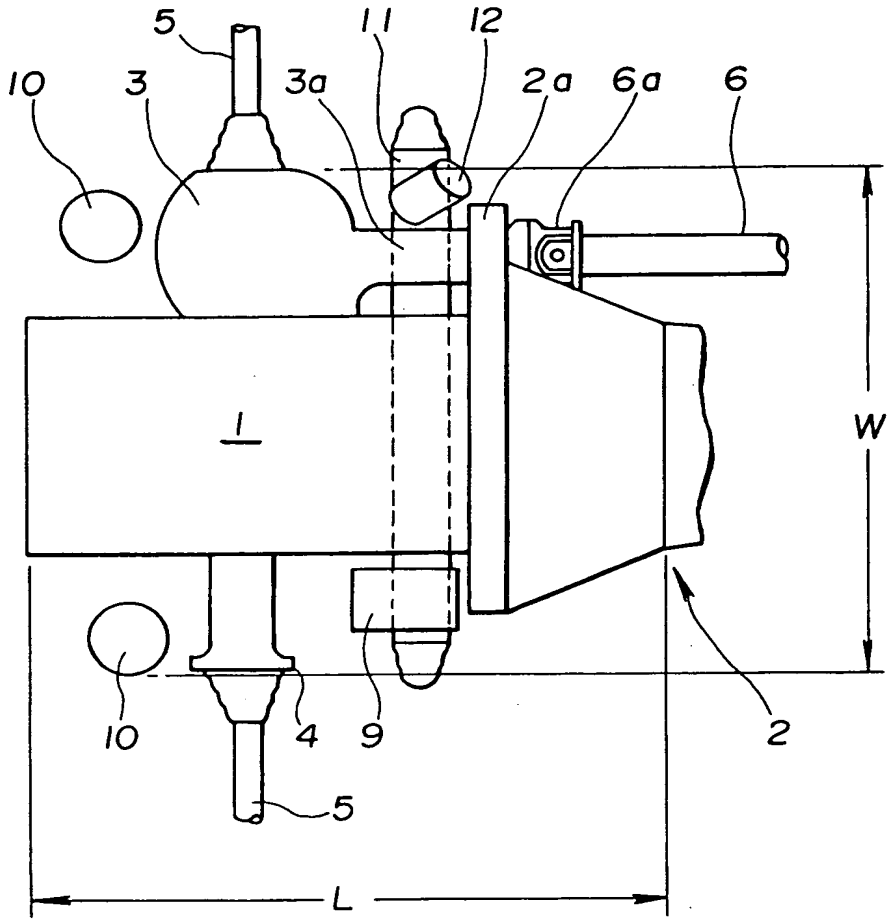

FIG. 4

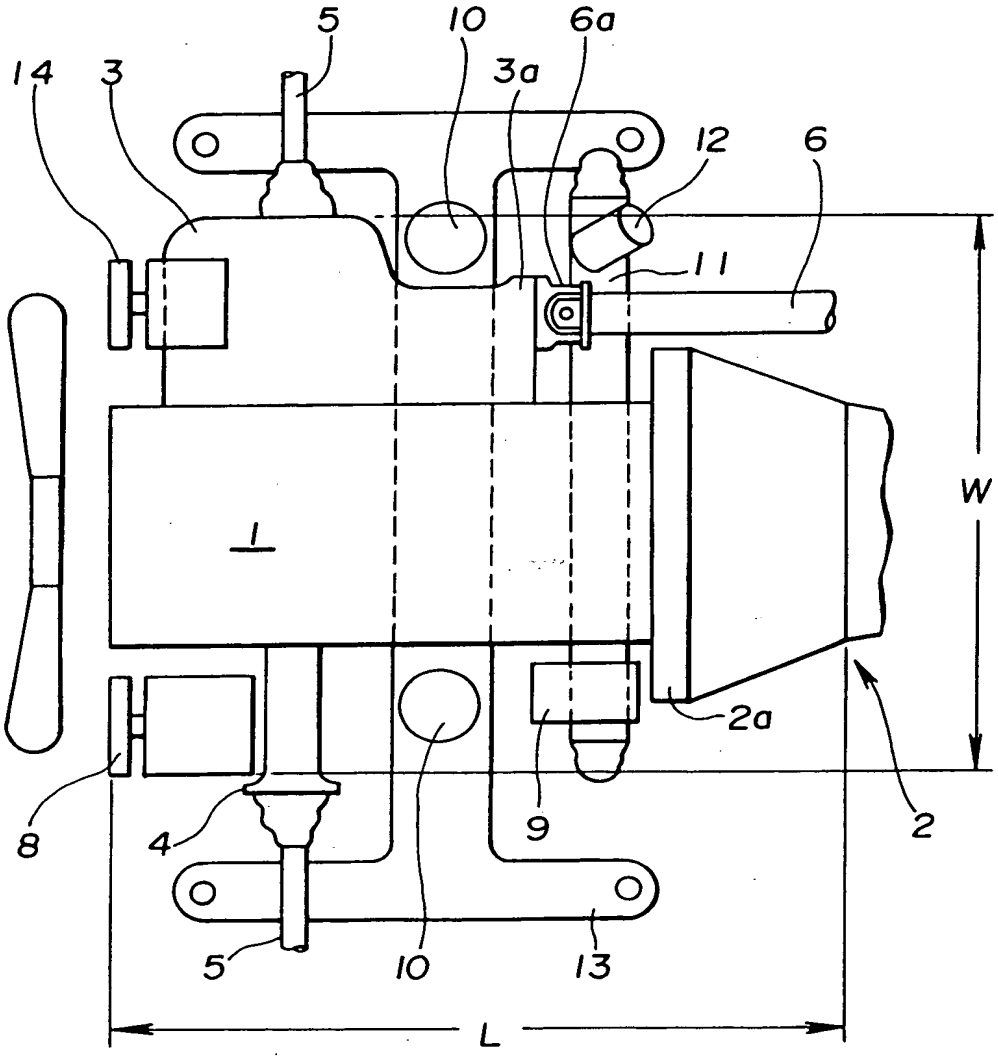

FIG.5

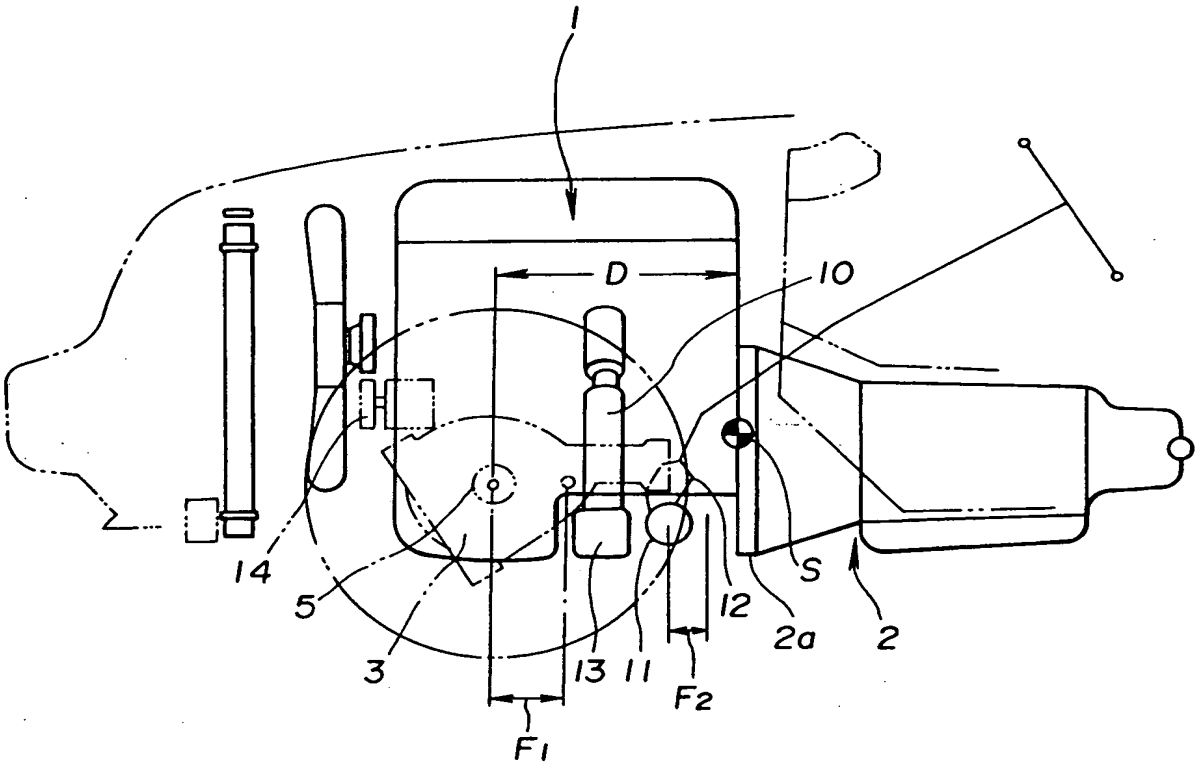

FIG.6